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ANOTHER ALIEN HAS LANDED: *EVAX PROLIFERA* IN MISSOURI

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In May, 1991, members of the Botany Group of the Webster Groves Nature Study Society, took an excursion to Missouri's Ozarks in search of various plant species. The group was nearing the Caney Mountain Wildlife Area north of Gainesville when we were flagged down by a display of Purple Penstemon along the road. We parked at the turnoff to the Area and walked back up the highway to enjoy the showy flowers of *Penstemon cobaea* var. *purpureus*. Upon reaching the roadside glade we were pleasantly surprised to see the white-eyed, purple blossoms of *Scutellaria bushii* as well. Then came a another surprise.

Marge Ruschill was the first to see them -- a host of gray-green sentinels at the edge of the glade, forming a dense population for about 20 meters. The plants were low like sedums, no more than 10 cm tall, but they were obviously not succulent in habit. The alternate leaves were flattened and spathulate, and were covered with a matted white hairiness. Each plant developed a leafy "cup" at its stem's summit, with more of the same spathulate leaves. The more robust specimens had spoke-like branches from these cups, each terminating in another leafy cup.

We tried our best to find a flower in one of these leafy cups. Betty Nellums discovered the skeletal remains of plants from the previous year, which had no more branches than some of the living specimens before us. At that time, however, all that we could see were amorphous green masses among the dense matted hairs. Later, we were to learn of the minute flowers, visible with the aid of a microscope.

Betty and Marge guessed the plants to be of the genus *Eriogonum* (Polygonaceae). This was a truly educated guess, based on their familiarity with Western roadside *Eriogonum* species, some of which also have white wooliness and "umbrella-branching". However, we soon determined that the new find was not the *Eriogonum* already known from Missouri, and the plants did not fit anywhere in the key to *Eriogonum* species in the *Flora of the Great Plains* (Great Plains Flora Association, 1986) or in Steyermark's (1963) flora.

Pat and Jack Harris turned our specimen over to George Yatskievych at the Flora of Missouri Project, who suspected that it represented a relative of *Gnaphalium*, in the tribe Inuleae of the Asteraceae. After careful examination under the microscope and a telephone conversation with a specialist on the taxonomy of this tribe, James Morefield of the Nevada Natural Heritage Program, the identity

of our sample was confirmed to be *Evax prolifera* Nutt. *ex* DC. (Asteraceae, tribe Inuleae). This species is native to open limestone areas and sandy roadsides in drier parts of the western United States, where it is commonly known as Rabbit Tobacco.

At the Ozark County site, plants grow at the edge of a dolomite glade, even approaching the "no-plants land" between the glade and the road shoulder. They are clearly not native to the area, but how they came to be introduced at the site remains a mystery. The skeletal remains we encountered indicate that the population has existed there for at least one year.

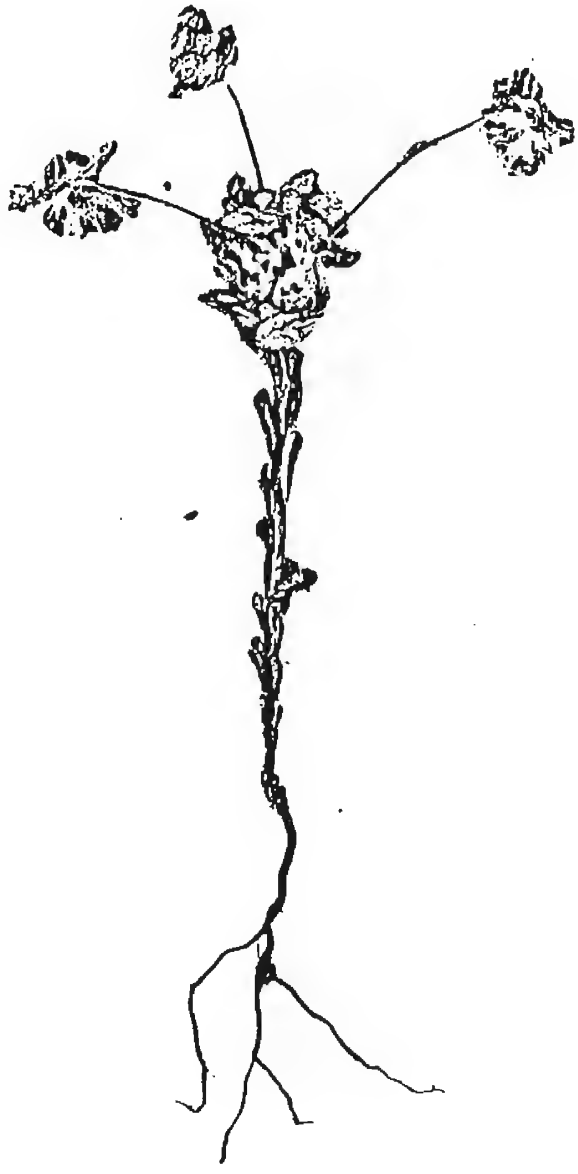

Figure 1. Xerograph of *Evax prolifera*.

As befits an alien, the plants have an eerie aspect (Figure 1). These oddly branched, densely hairy curiosities are easily overlooked, but are striking once noticed. The prominent leafy cups contain amorphous masses of indistinguishable flower heads. These shapeless masses, called glomerules, are visible to the eye as small green "blobs", and we can be forgiven if we were looking for more obvious evidence of blooming. The individual flowers are only about 1/2 mm long and are of two types. Flowers that appear to produce both stamens and pistils are functionally staminate and bear no seed. The seed-producing flowers do not resemble those of any other Missouri composite, lacking a corolla, pappus, and stamens.

The plants are annuals and proliferate by seed. They are evidently quite short-lived. We originally encountered the population in flower on May 15, but by June 15, when members of the Missouri Native Plant Society revisited the site, all of the plants had died and dried to skeletal remains. These odd ephemerals may be present along other Missouri roadsides, but it will take a keen eye, good timing, and lots of luck to spot them.

The species epithet *prolifera* probably refers to the dense stands formed by this plant. The word is sometimes used for the production of new starts on side shoots, which our species does not have. But the epithet might refer to the spokelike branches producing new leafy cups in some individuals.

A collection of *Evax prolifera* from the Missouri population has been deposited in the herbarium of the Missouri Botanical Garden Herbarium (MO) and bears the following label:

> OZARK COUNTY, along road shoulder of State Highway 181 about 1/4 mile northeast of entrance to Caney Mountain Wildlife Refuge; NW 1/4 SEC. 15, T. 23 N, R 13 W, 15 May 1991, *Webster Groves Nature Study Society s.n.*

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STUDIES IN THE FLORA OF MISSOURI, III.

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The publication of the recent checklist of Missouri's flora (Yatskievych and Turner, 1990) has spurred other studies on various aspects of the state's flora. Although intended to be a complete list of the plants growing outside of cultivation in Missouri, several species were omitted from consideration for that catalogue, either because further research was necessary to confirm certain determinations or because several manuscripts already in progress were not completed in time. Hopefully the next few field seasons will continue to provide a variety of additional state records by the various students of the Missouri flora, as well as further refinements in our understanding of the taxonomy and distribution of species growing in the state.

NEW SPECIES RECORDS

Aphanes microcarpa (Bolss. & Reuter) Rothm. (Rosaceae), commonly known as Parsley Piert, is a spring-flowering annual native to Europe. The stems are unbranched, or branched from the base, and can grow to 10 cm long. The alternate leaves, which are palmately lobed and toothed, resemble those of storksbill (*Geranium* spp.). The tiny flowers lack petals and are clustered in the leaf axils, all but hidden by the large, leaflike stipules. This species was recently collected in Missouri for the first time: HOWELL COUNTY, 4 mi SW of West Plains, at Warden Prairie, 30 May 1990, *Summers 3248* (MO).

In North America, this introduced species is widely distributed in open, disturbed sites, particularly in Coastal Plain areas of the southeastern United States (Robertson, 1974). Although not previously collected in Missouri, Parsley Piert occurs in several Arkansas counties, the closest being in White County (Smith, 1988), about 160 km to the southeast of the Missouri population.

The unusual vegetative and flowering characteristics of *Aphanes microcarpa* insure that it would not key close to its nearest relatives in Steyermark's (1963) flora. The lack of petals and irregularly lobed leaves cannot be accounted for in the key to genera of Rosaceae, although most users would probably "force" plants into *Geum*. In fact, *Aphanes* has no close relatives in the Missouri flora, although most botanists consider it an unusual member of the tribe Sanguisorbeae, which includes the agrimonies (*Agrimonia* spp.). However, botanists who attempt to key this species using Steyermark's (1963) key to families would have further problems, as it keys closest to Violaceae.

There is some disagreement on what level the species comprising *Aphanes* should be recognized, taxonomically. Most North American treatments (e.g., Robertson, 1974) continue to recognize the group of annuals with 1-2 extrorse stamens (anthers positioned facing toward outside of flower) inserted opposite a calyx lobe and along the inner edge of a nectar ring in the flower as a section of the genus *Alchemilla*, and refer to our plant as *Alchemilla microcarpa* Boiss. & Reuter. However, botanists in South America and Europe, where diverse members of the complex are native, usually restrict the genus *Alchemilla* to a smaller group of perennials with 4, introrse stamens inserted alternate with the calyx lobes and along the outer edge of the nectar ring, as a separate genus (e.g., Reichgelt, 1952). Although a thorough taxonomic revision of this group is lacking, *Aphanes* appears amply distinct from *Alchemilla* and deserves treatment as a separate genus.

Dichondra carolinensis Michaux (Convolvulaceae), or Pony-foot, is a new species in a new genus for the state. It was discovered by Bill Summers while driving through a pastured field in Howell County. The population occupies an area ca. 7 m in diameter, in a low, rocky area at the edge of a wet to seasonally flooded, shallow drainage. The adjacent field has been pastured, but not farmed or hayed, for many years (it has been owned by the Summers family since 1912). Although the locality was cleared of timber early in this century, the lack of recent disturbance and absence of introduced species in the immediate vicinity suggest that Pony-foot might be native at this site. Locality data for a voucher specimen are: HOWELL COUNTY, along Rattlesnake Draft, Summers farm, ca. 3 1/2 mi N of Brandsville, 16 Nov 1988, *Summers 2840* (MO).

Dichondra carolinensis is widely distributed in the southeastern United States from Virginia to Florida and westward to Arkansas and Texas (Wilson, 1960). It grows in a wide variety of wet and seasonally wet habitats, and is a common lawn weed in some areas. Plants are also sometimes cultivated as a lawn substitute and soil binder in some areas, and have been listed in the horticultural trade as Dew-drop Grass, or Dichondra. The closest locality to the Missouri population is in Pope County, Arkansas (Smith, 1988), about 150 km to the southwest.

Pony-foot spreads as tangled mats of prostrate stems, rooting at the nodes. The small, alternate leaves are broadly ovate to orbicular, and commonly cordate. Small, stalked flowers arise singly from the leaf axils and have white to purple petals (white in the Missouri material). The fruits are small, deeply two-lobed capsules. Various floras describe the species as annual or perennial, but it does overwinter in warmer areas.

The taxonomy of *Dichondra* has not been well studied, and there is controversy concerning the relationship between our southeastern taxon and the widespread, pantropical, *D. repens* Forster. North American plants are listed as *D. repens* var. *carolinensis* (Michaux) Choisy in many regional floras (Wilson, 1960).

Plants of this taxon do not key well in Steyermark's (1963) flora. In the key to families, specimens will key quickly, but erroneously, to the family Menispermaceae. Even within the Convolvulaceae, the genus will not key well to any of the genera included by Steyermark, because of conflicting characters. The genus is unique among Missouri Convolvulaceae in its deeply two-lobed ovary with 2 gynobasic (attached in the notch between the lobes) styles, and its small, broad, cordate leaves.

Drew (1944) described the commercial sale of dew-drop grass as a lawn substitute in Missouri and Kansas during the early 1940's. He conducted field tests in the Columbia, Missouri, area on two accessions of plants then available, and concluded that the species was unsuitable for cultivation in the Midwest and Plains states. The plants studied by Drew neither overwintered successfully, nor regenerated from seed, in spite of vigorous growth and flowering the first season. In contrast, observations indicate that the Howell County population flowers in mid-June and subsequently sets seed and overwinters (although foliage is frequently damaged during cold weather). There is little reason to believe that the Howell County population was planted, because there is no old homesite in the vicinity and the immediate area shows no evidence of recent, heavy disturbance.

Microstegium vimineum (Trin.) A. Camus (Poaceae), sometimes known as Eulalia, is an annual grass native to Asia. It has become established at scattered sites in the eastern half of the United States, including Pope and Massac counties in southern Illinois (Mohlenbrock, 1986) and Franklin and Johnson counties, in northwestern Arkansas (Smith, 1988). The North American distributional range of this species is apparently expanding, as indicated by its relatively recent discovery in several states. In Missouri, *Microstegium vimineum* was discovered in Oregon County, in a low woods near a spring, where it was either introduced following flooding of the adjacent Eleven Point River, or as a result of human disturbance along an old roadbed at the site. Voucher data are: OREGON COUNTY, low woods bordering Blue Spring, 2 mi E of Billmore, 3 Nov 1990, *Summers and Dodds 3920* (MO).

Microstegium vimineum is a decumbent annual, forming loose mats. The inflorescences are loose clusters of few, small racemes. The spikelets are paired at each node, with both the sessile and stalked spikelets fertile. Among the grasses, the genus is classified in the tribe Andropogoneae, which includes several Missouri genera, notably the bluestems (*Andropogon*, *Bothriochloa*, and *Schizachyrium*). However, it has no close relatives among Missouri grasses and does not key well in Steyermark's (1963) key to grass genera. *Miscanthus*, an Asian genus of large, perennial plants, three species of which have escaped from cultivation in the state, is the closest relative of *Microstegium* in Missouri, but these genera differ by so many gross-morphological characters, including plant size, longevity, habit, and inflorescence and spikelet structure, that no one would

be likely to confuse the two groups.

Sacciolepis striata (L.) Nash (Poaceae), commonly known as American Cupscale, is a perennial grass often forming dense stands in a variety of wetland habitats. Although widespread in the Caribbean Islands and in Central and South America, its U.S. distribution is primarily in Coastal Plain areas from New Jersey southward to Florida, and west to Texas. The species has also been reported previously from scattered inland localities in Oklahoma, Arkansas, and Tennessee.

Recently, a new population of this species was located along the margin of a sinkhole pond, during a Missouri Native Plant Society fieldtrip. A voucher specimen was collected: OREGON COUNTY, Brushy Pond, on E side of State Highway 19, N of Greer, 15 Sep 1990, *Yatskievych & Summers 90-404* (MO). At this site, plants form a dense patch ca. 3 m in diameter, with numerous flowering and fruiting stems, situated among *Cephalanthus* (Buttonbush) shrubs along the wet shore, near the contact zone between wetter soils and the drier, cherty slopes rimming the pond.

American Cupscale is so known because of the large, broadly inflated second glume of each spikelet. The spikelets superficially resemble those of *Panicum* species, with shiny, white, hardened, fertile lemmas, but although this species would key to *Panicum* in Steyermark's (1963) flora, it is easily distinguished from that genus by its inflated glumes. An interesting observation is that the inflorescences of *Sacciolepis striata* shatter quite easily, sometimes shedding spikelets before the fruits are quite mature.

The Oregon County site for American Cupscale contains the northwesternmost population of this species known to date. It is about 300 km north of the closest previously known site, in Saline County, Arkansas (Smith, 1988). Originally, plants were probably dispersed into the area by waterfowl, but the size, persistence, and evidence of reproduction of the population indicates that this happened long ago, and the species should be considered an addition to the native flora of Missouri.

The Green Foxtail, *Setaria viridis* (L.) P. Beauv. (Poaceae), is a Eurasian introduction that is widespread in Missouri. Previous collections of this species from the state have all been referable to var. *viridis*, but a second variety, *S. viridis* var. *major* (Gaudin) Posp., is also commonly encountered in some parts of the United States. This variety resembles the Nodding Foxtail, *S. faberi* F. Herm., in general aspect. Like the nodding foxtail, the var. *major* is a larger, coarser plant than typical *S. viridis*, with stems to nearly 2 m long, leaves to 25 mm wide, and the inflorescence nodding (though not as much as in *S. faberi*). However, it has the glabrous leaves and spikelet characteristics typical of *S. viridis*, and would key fairly well to that species in Steyermark's (1963) flora. Although this variety is

undoubtedly fairly widespread, at least in eastern Missouri, the first collection from the state has only recently been made. Plants grew spontaneously on a pile of topsoil that originated from along the Meramec River in west St. Louis County. Voucher data are: ST. LOUIS (city), garden in yard of residence, 4118 Utah Street, 11 Aug 1990, *K. & G. Yatskievych 90-272* (MO).

The Section *Beccabunga* of the genus *Veronica* (Scrophulariaceae) is represented in Steyermark's (1963) flora by two morphologically similar species, *V. americana* (Raf.) Schwein. *ex* Benth. (American Brooklime) and *V. comosa* Richter (Water Speedwell), the latter usually treated as *V. catenata* Pennell in most of the recent literature (Yatskievych and Turner, 1990). To these, we now add the European Brooklime, *V. beccabunga* L., an introduced taxon native to the Old World.

This species was discovered at a small spring near Bloomsdale, in Ste. Genevieve County. Plants formed a dense colony in shallow water along the entire length of the short spring branch leading to Establishment Creek, and also for a short distance along the main creek bank. This initial site was subsequently channelized and filled with gravel. However, although the original site was destroyed by this action, a second colony was later observed growing further upstream, near the Lake Ski dam. Only the original site has been vouchered: STE. GENEVIEVE COUNTY, spring branch along Establishment Creek on Rocky Ridge Ranch near Bloomsdale, 15 May 1976, *Summers 219* (MO).

Veronica beccabunga will key to *V. americana* in Steyermark's (1963) flora. In Missouri, the latter taxon is known from a single, historical locality. European and American brooklimes are closely related and are sometimes treated as varieties of a single species, *V. beccabunga* var. *beccabunga* and var. *americana* Raf. The two taxa are easily distinguished by differences in leaf shape: widest above middle and with rounded tip in European brooklime, versus widest below middle, with obtusely pointed tip in American Brooklime. There are also cytological differences between the two taxa: *V. beccabunga* is a diploid ($2n=18$), while *V. americana* is tetraploid ($2n=36$) (Schlenker, 1936). Although the two taxa are not known to hybridize in nature, a sterile, artificial hybrid was produced by Schlenker (1936). Among the three subspecies of *V. beccabunga* recognized by Fischer (1985), Missouri materials key best to ssp. *beccabunga*, but these infraspecific taxa are poorly defined and not easily distinguishable. Therefore, although the European Brooklime seems best treated as a separate species from its American relative, subspecies recognition does not seem warranted, at least based on New World collections.

THE GENUS *LIGUSTRUM* IN MISSOURI

The genus *Ligustrum* (Oleaceae), the privets, contains about 30 species of shrubs, mostly in eastern Asia and Malaysia. Several of the species are cultivated

as ornamentals, both for their attractive foliage and for their fragrant, white flowers. Most of these escape and become established in areas where they are grown. For example, Hardin (1974) listed eight species for the southeastern United States.

Steyermark (1963) included only two species in his treatment for the *Flora of Missouri*. Of these, *L. ovalifolium* Hassk., the California Privet, was considered a rare escape from cultivation at a single site in Texas County, and has apparently not been collected in the state since that time. The other species, *L. vulgare* L., or Common Privet, was technically excluded from the flora, but was given a full treatment and illustration, based on the expectation that it would eventually be discovered growing outside of cultivation in the state. Although this species is still widely cultivated as a hedge plant and undoubtedly escapes from cultivation around urban areas, it has yet to be documented as established anywhere in Missouri. It should be searched for in the St. Louis and Kansas City areas.

Recently, we attempted to update the records of privets growing outside of cultivation in Missouri, both through a search of recent collections at MO and through additional field work. Privets are not often collected, but we were able to accumulate data on two different taxa. We were surprised to find that neither of these was among the species included by Steyermark (1963).

Plants ascribed to *L. vulgare* have long been known to escape from cultivation on the grounds of the Shaw Arboretum at Gray Summit, in Franklin County, with collections dating back to 1970. The berries of shrubs originally cultivated at the Arboretum have apparently been spread over the years by birds or mammals. Plants are now well established and considered weedy pests along some roadsides and trails on the grounds. Recent, ample material from the Arboretum was kindly provided by Bill Davit of the Missouri Botanical Garden. These were determined not to be *L. vulgare*, but were instead *L. obtusifolium* Siebold & Zucc. The following collections at MO voucher this species in Missouri: FRANKLIN COUNTY, Shaw Arboretum, Gray Summit, 29 Sep 1970, *Andreasen et al. 68*; same locality, 30 May 1972, *Shea 182*; same locality, 24 May 1990, *Davit s.n.*.

A different species of privet was discovered during recent field work in southeastern Missouri. This shrub was uncommon in sandy soil along an old dirt track bordering a flat, seasonally inundated, oak forest. It keyed to *L. sinense* Lour. in recent keys to privet species (e.g., Hardin, 1974). Voucher data are: DUNKLIN COUNTY, Wilhelmina State Forest, NW of Wilhelmina, ca. 1/2 mi W of County Road 203, 22 August 1990, *Yatskievych & Ladd 90-296* (MO).

Several authors have pointed out that species limits among the cultivated privets are not well understood. Wilson and Wood (1959) and Hardin (1974) point to the lack of a recent revision of Asian *Ligustrum* and suggest that until species in this genus are well understood in regions where they grow natively,

It will be impossible to revise those species escaping from cultivation in the United States. The following key is adapted from Hardin (1974), and will distinguish flowering specimens of species currently thought to grow in Missouri. Sterile or fruiting material is often difficult to determine and requires direct comparisons with authentic, representative specimens in the herbarium.

KEY TO MISSOURI *LIGUSTRUM* SPECIES

1. Twigs pubescent
   2. Corolla tube longer than the lobes; calyx pubescent *Ligustrum obtusifolium*
   2. Corolla tube as long as, or shorter than, the lobes
      3. Twigs densely pubescent, leaves pubescent on abaxial (underside) midrib *Ligustrum sinense*
      3. Twigs minutely puberulent, leaves glabrous *Ligustrum vulgare* (excluded species)
1. Twigs glabrous
   2. Corolla tube as long as, or shorter than, the lobes *Ligustrum vulgare* (excluded species)
   2. Corollas tube longer than the lobes *Ligustrum ovalifolium*

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After the Ice Age, The return of life to Glaciated North America. by E. C. Pielou. Copyright 1991. The University of Chicago Press. Chicago. 366 pp. IBSN 0-226-66811 (cloth) $24.95.

This book, by one of the world's leading biogeographers, is a lucid account of how the face of North America was affected by the Pleistocene Ice Age. For those who have no special training in glaciology, the account of the causes of ice sheets, their advances and retreats, is most fascinating. Of special interest is how the patterns of ice melt shaped the current ranges of many plants and animals.

It is also evident from the research reviewed by Pielou that the development of biotic communities after the retreat of the ice sheets was influenced by successional events that were often quite unique, responding to local conditions and the availability of sources of colonizers. Pielou also make the point that life seldom, if ever repeats itself, because the combination of factors controlling biotic development is not likely to be exactly replicated in either time or space. This point should certainly be considered by those who would try to recreate biotic communities that existed at some point in time in the distant past. Also, it is clear from reading this book that is spite of our justified concerns about global warming, we are in store for more massive continental glaciers in the relatively near geological future.

Though the price of this book is high, it is one that should be in the library of anyone concerned with conservation, the preservation of biodiversity, or restoration ecology. **Paul L. Redfearn, Jr.**

THE MISSOURI FLORA GEOGRAPHIC INFORMATION SYSTEM AND A PROPOSED ATLAS OF VASCULAR PLANT FLORA IN MISSOURI

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INTRODUCTION

In 1983, the Missouri Flora Geographic Information System (GIS) project at Southwest Missouri State University commenced with the purpose of creating a computer database of all recorded plant taxa in Missouri, along with their counties of occurrence and other ancillary information. Although a number of uses may be made of this information, the primary stimulus for creation of the GIS was the intent of publishing an atlas of vascular plant distribution in Missouri.

The Atlas Project--An Historical Perspective

In 1963, Julian Steyermark published the *Flora of Missouri.* This landmark compendium included the taxonomy, description, and geographic distribution of over 3200 taxa in Missouri. Since its publication, the *Flora of Missouri* has been the single most important source book for botanists seeking to explore, document, or research Missouri vegetation. Steyermark's dot maps of plant distribution remain an effective method of visualizing the dispersion of taxa across the state. During the almost thirty years since the *Flora of Missouri* was published, botanists from around the state of Missouri, as well as other states, have continued to collect and document the distribution of plant taxa in Missouri. New taxa, not included in the *Flora* have been found, and previously recorded plants have been found in counties where they were not previously recorded.

However, except for occasional comments concerning the discovery of state and county records in various journal articles, theses, and reports, no organized attempt was made to keep an updated record of the distribution of Missouri taxa over most of these years. In 1980 Norlan Henderson made a significant contribution to updating species distribution records by publishing in a Department of Conservation report, 1748 county records.

In the summer of 1979, the **Missouri Native Plant Society** was formed, an event which fostered a renewed interest in Missouri botany and eventually stimulated such current activities as an update of plant distribution in Missouri. The society soon initiated publication of *Missouriensis,* a journal dedicated to the Missouri flora, and a vehicle which would allow botanists to communicate their discovery of new distribution records.

In 1981 procedures were adopted by the society for updating Steyermark's records. These included creation of an official register for state and county records, subsequently known as the *Botanical Record.* The junior author was designated editor and the first number of its publication appeared the following year (1982) in *Missouriensis* 4 (1). During the 9 intervening years, 13 *Botanical Records* have been published. To date, 58 lists of county records, contributed by 38 members of MONPS, have been added and published in the first 14 *Botanical Records.* These lists have included over 4100 county records and the collections of over 370 persons. Several associate editors have contributed much to the publication of these records and included Doug Ladd, Jay Raviell, and Jon Rebman.

As this new information accumulated, it became necessary to update Steyermark's pre-1963 dot distribution maps. Thus, efforts toward achieving one of the **Missouri Native Plant Society's** first (and major) goals--publishing a complete revision of the distribution maps for all Missouri's flora in the form of an atlas--was begun in 1983 at Southwest Missouri State University. However, because of the widespread use of computers and computerized databases, it was decided to store and distribute much of the information in computer-usable form rather than only as paper maps. Furthermore, the advantage to using computer databases is threefold: they may be relatively easily updated to reflect new information, they may be easily used for research purposes requiring tabulation of taxa or county information, and they may be easily and quickly distributed.

The Missouri Flora GIS project's major objective, publishing a complete revision of the distribution maps for all Missouri's flora, has not yet been reached. Although a significant number of records have been added (including most of those submitted to us) many records remain to be submitted for publication. These include lists of taxa from various personal collections and lists of taxa from earlier collections already in herbaria. Many of those in the latter category could be identified from lists in theses and other scientific publications.

It is our intention, for critical review purposes, to print drafts of an atlas in its present state of completeness, with a more complete, revised version projected to coincide with publication of the projected new Missouri Flora. Currently our database contains the taxa and nomenclature used by Steyermark. With the recent publication of the *Catalogue of the Flora of Missouri,* by Yatskievych and Turner (1990), it will be necessary to update nomenclature and modify

Steyermarks's original list of taxa in the projected revised version.

Since the information collected in this project is freely available to all interested parties, a description of the database and data collection activities may be of interest to those who wish to use the data in a form other than paper maps.

Database Creation

County Records

The first and major portion of this project involved converting Steyermark's (1963) distribution maps into computer-readable form along with the scientific name of each taxon. A microcomputer and a graphics tablet digitizer were used, along with programs written specifically for the project, to digitize over three thousand maps. This activity took more than four years and was largely accomplished by Richard Humphrey during his tenure as a graduate student. Accuracy checking of this information, by members of the Missouri Native Plant Society, took another two years.

The second phase of information assimilation involved the addition of information published since Steyermark's flora. The update records were entered into the database, and each published list, containing numerous individual contributors, was given a single identifying code. Henderson's (1980) list of additions marks another large corpus of records, and this list was given its own separate code. Currently the database contains fourteen contributor or list codes, one for Steyermark, one for Henderson, and one for each list published in *Missouriensis*. Thus, any record of a taxon in a county is identifiable by contributor or published list. The recording of data from Henderson's publication, as well as from all *Botanical Records* are still being proofread.

Each taxon has an entry in the database similar to Figure 1. The main portions of the record are: family, genus, specific epithet, subspecific epithet, map number, and county record. To record county occurrence information, Steyermark's (1963) county numbering system was used (Figure 2). These county numbers were used as entries in the database. Boone County, for example, is known in the database as county 40. The county record information is an array of numbers or letters where the position in the array denotes the county (e.g., the first number refers to county 1 or Atchison County; the fortieth number refers to county 40 or Boone County), and the number at that position refers to the contributor or list of contributors that recorded the taxon in that county. A zero means the taxon is not recorded in the county, a one means Steyermark recorded it there, a two Henderson, an "a" indicates the first *Missouriensis* list, a "b" the second, etc.

Steyermark (1963) used only one map number for each species, even

though several subspecific taxa might be listed, and the map number information has been kept as close as possible to Steyermark's numbering system, with a few

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ALISMACEAE
SAGITTARIA GRAMINEA V.GRAMINEA 96
0 0 0 
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Figure 2. Steyermark's County Numbers. Each county was assigned a number, starting in the northwest corner of the state and working southward in rows.

Map Base

An outline map of Missouri was extracted and generalized from the 1970 County DIME file of the U.S. Census Bureau (as distributed by Harvard University with the Odyssey mapping and geographic information system software). This map contains approximately three hundred latitude/longitude points outlining the counties of Missouri, as well as identifier information allowing the association of thematic data such as taxon numbers with each of the counties. Federal Information Processing System (FIPS) county codes are used to identify each county, and these are keyed to the county numbers illustrated in Figure 2. Simple computer programs then extract any requested county information from the flora database, associate the FIPS codes with each county record, and present the data to the Odyssey mapping system to produce county maps.

Other Examples of Use

To date, the most-used product derived from this database has been the county record list. Using simple programs in a commonly available computer software system (SAS), it is possible to list all the taxa occurring in a county, or all the taxa not occurring in a county. These lists are useful to those who may be interested in the floristics of a county or area within a county. It can be used as a check against the completeness of a particular study, or as a challenge to add to the already known floristic composition of an area. Similarly, it is possible to list all the taxa occurring in a group of counties but not in some other county. In this way, adjacent counties surrounding another county can be examined for distributional continuity through space, and certain taxa may be targeted for county voucher collections.

More quantitative approaches to biogeography are also possible. Figure 3 is a map of the number of taxa reported for each county in Steyermark (1963). While it is obvious that the habitat determines the number of naturally occurring plant taxa in a county, the **actual** records of occurrence show some interesting relationships among counties. For instance, the four counties with the highest number of taxa are St. Louis (1813), Jackson (1516), Jasper (1505), and Boone (1246), none of which would rank among the top counties of Missouri in habitat diversity. However, three of the four are high population centers with major universities, while all four have had residents who were prolific plant collectors. Jasper county, in the southwest corner of the state, remains unique among Ozark counties in its high number of records, ranking fourth in total number of taxa. This is apparently because Steyermark's principle collaborator, E.J. Palmer lived and collected in this county (see Palmer and Steyermark, 1935; also Steyermark, 1963, p. xxiv). Viktor Muhlenbach, who collected along railroad tracks in St. Louis for nearly 30 years, added greatly to the flora of that county (not all of his more recent collections have been added to our database). Other notable collectors in these counties include Bush in Jackson County, Rickett in Boone County, and Eggert in St. Louis County. It appears as if concentrations of people and botanists lead to concentrations of plant records.

Figure 4 reinforces this concept, illustrating the number of taxa present in a county that are missing from one or more of the immediately adjacent counties. Certainly there are instances where habitat changes dramatically from one county to another, especially in moving from a county next to the Mississippi to one farther west. But the discrepancies that show up for the Kansas City area (Jackson County) versus its adjacent counties, and Boone County are too great to be explained by anything other than human activity. Not withstanding that some of these are urban areas, where there may be a more diverse weed flora, it appears that where collectors live or frequently visit they find and record taxa.

Future research on the overall distribution of taxa in Missouri can utilize up-to-date records as well as the Steyermark data. It will be interesting to see how Figures 3 and 4 change as the updated information becomes available.

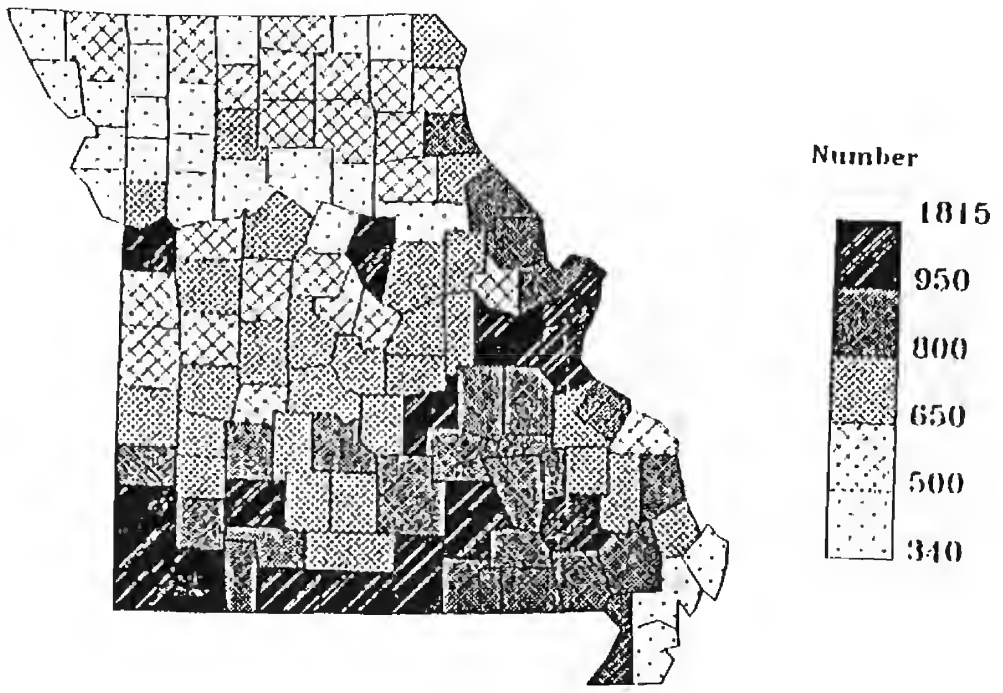

Figure 3. Number of Taxa by County.

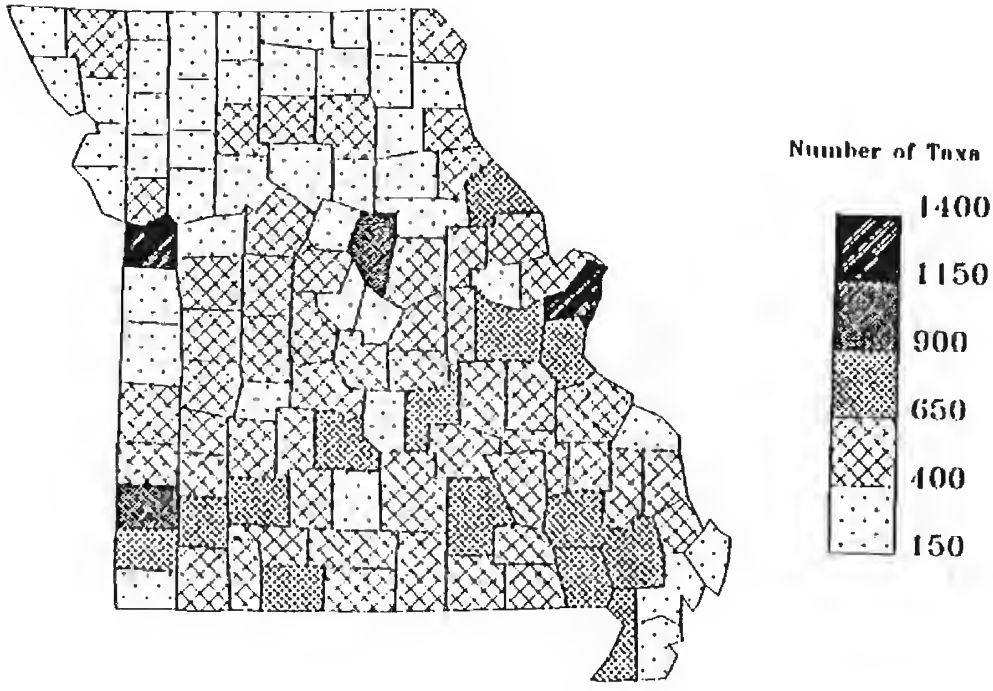

Figure 4. Number of Taxa in a County, but Not Found in One or More Adjacent Counties.

Summary

The Missouri Flora Geographic Information System provides an up-to-date record of Missouri flora and a research tool for investigations into plant distributions in Missouri. Requests for products should be addressed to the authors.

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Palmer, E. J., and Steyermark, J.A. 1935. An annotated catalogue of the flowering plants of Missouri. Annals Missouri Bot. Gard. 22: 375-758.

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Yatskievych, George and J. Turner. 1990. *Catalogue of the Flora of Missouri*. Monogr. Syst. Bot. Missouri Bot. Gard. 37: i-xii, 1-345.

MISSOURI BOTANICAL RECORD 14

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The *Missouri Botanical Record* is the official register for new county records of all vascular plant taxa in Missouri. To qualify for inclusion in this record, a voucher specimen of the record taxon must be deposited in a recognized herbarium and verified by the curator. Following the format used below, please submit all records to Dr. Wallace R. Weber, Department of Biology, Southwest Missouri State University, Springfield, MO 65804-0095.

In the *Flora of Missouri*, Steyermark used only a single map number to refer to each species, even though several subspecific taxa were listed. In these instances, various symbols were used to represent each taxon on a single Missouri map with counties. In the *Missouri Botanical Record* a decimal system is used, with .10 assigned to the first subspecific taxon listed by Steyermark, .20 for the second, and so on. Point nine nine (.99) is used to designate a species in which Steyermark included one or more subspecific taxa, but which was not specified by the collector. Point zero nine (.09) identifies a taxon not included in Steyermark.

Contributors for this issue include: Mike Skinner, Southwest Missouri State University and Melvin Conrad, Northeast Missouri State University.

TAXA	COUNTY	COLLECTOR	HERB	MAP NO
		EQUISETACEAE		
EQUISETUM ARVENSE	KNOX	*WELTON S.N.*	NEMO	10 99
		OPHIOGLOSSACEAE		
BOTRYCHIUM DISSECTUM V. *OBLIQUUM*	MACON	*HEIN 27*	NEMO	14.20
		TYPHACEAE		
TYPHA ANGUSTIFOLIA	MILLER	*NAGEL 254*	DNR	70.00
		NAJADACEAE		
NAJAS GUADALUPENSIS	ADAIR	*KITCH 9*	NEMO	89.00
		ALISMACEAE		
ALISMA PLANTAGO-AQUATICA	RANDOLPH	*CONRAD 8407*	NEMO	90.00
SAGITTARIA GRAMINEA V. *GRAMINEA*	RANDOLPH	*CONRAD 10331*	NEMO	96.00
		GRAMINEAE		
BROMUS RACEMOSUS	MILLER	*SKINNER 987*	DNR	111.00
BROMUS JAPONICUS	MILLER	*SKINNER 990*	DNR	113.00
BROMUS JAPONICUS	KNOX	*WELTON S.N.*	NEMO	113.00
BROMUS TECTORUM V. *TECTORUM*	KNOX	*WELTON S.N.*	NEMO	116.00
BROMUS STERILIS	CAMDEN	*SKINNER 894*	DNR	115.00
FESTUCA ELATIOR V. *ELATIOR* F. *ELATIOR*	ADAIR	*WELTON S.N.*	NEMO	120.00
FESTUCA ELATIOR V. *ELATIOR* F. *ELATIOR*	CLARK	*WALKER 572*	NEMO	120.00
FESTUCA RUBRA	RANDOLPH	*CONRAD 10197*	NEMO	123.99
GLYCERIA STRIATA V. *STRIATA*	RANDOLPH	*CONRAD 8074*	NEMO	129.00
POA COMPRESSA	MILLER	*SKINNER 996*	DNR	133.00
POA COMPRESSA	KNOX	*WELTON S.N.*	NEMO	133.00
POA BULBOSA	ADAIR	*WALKER 442*	NEMO	139.00
POA BULBOSA	CAMDEN	*SKINNER 875*	DNR	139.00
POA BULBOSA	MILLER	*SKINNER 881*	DNR	139.00
ERAGROSTIS HYPNOIDES	RANDOLPH	*CONRAD 10330*	NEMO	143.00
ERAGROSTIS SPECTABILIS V. *SPARSIHIRSUTA*	ADAIR	*WALKER 201*	NEMO	154.10
DACTYLIS GLOMERATA	CAMDEN	*SKINNER 912*	DNR	164.99
PHRAGMITES COMMUNIS V. *BERLANDIERI*	SHELBY	*CONRAD 10060*	NEMO	166.00
TRITICUM AESTIVUM	ADAIR	*WELTON S.N.*	NEMO	177.00
ELYMUS VILLOSUS F. *VILLOSUS*	KNOX	*WELTON S.N.*	NEMO	181.00
ELYMUS VILLOSUS	CAMDEN	*SKINNER 962*	DNR	181.99
ELYMUS VIRGINICUS V. *VIRGINICUS* F. *VIRGINICUS*	KNOX	*WELTON S.N.*	NEMO	185.00
ELYMUS CANADENSIS F. *GLAUCIFOLIUS*	ADAIR	*WELTON S.N.*	NEMO	183.10
HORDEUM PUSILLUM	ADAIR	*WELTON S.N.*	NEMO	189.00
HORDEUM PUSILLUM	CAMDEN	*SKINNER 888*	DNR	189.00
LOLIUM PERENNE	MILLER	*SKINNER 994*	DNR	191.00
SPHENOPHOLIS INTERMEDIA	MILLER	*SKINNER 897*	DNR	196.00

SPHENOPHOLIS INTERMEDIA	ADAIR	*WALKER 115*	NEMO	196.00
AGROSTIS ALBA	MILLER	*SKINNER 997*	DNR	212.99
AGROSTIS HYEMALIS	CAMDEN	*SKINNER 903*	DNR	215.99
ALOPECURUS CAROLINIANUS	ADAIR	*WALKER 39*	NEMO	220.00
MUHLENBERGIA CUSPIDATA	ADAIR	*CONRAD 10494*	NEMO	222.00
ELEUSINE INDICA	CLARK	*WALKER 577*	NEMO	256.00
BOUTELOUA CURTIPENDULA	ADAIR	*WALKER 2*	NEMO	264.00
PHALARIS ARUNDINACEA	RANDOLPH	*CONRAD 10184*	NEMO	271.00
PHALARIS ARUNDINACEA	MILLER	*SKINNER 991*	DNR	271.00
DIGITARIA SANGUINALIS V. *SANGUINALIS*	ADAIR	*BELL S.N.*	SEMO	278.00
DIGITARIA SANGUINALIS V. *SANGUINALIS*	CLARK	*WALKER 578*	NEMO	278.00
PASPALUM CILIATIFOLIUM V. *MUHLENBERGII*	ADAIR	*WALKER 49*	NEMO	291.10
PANICUM LANUGINOSUM V. *FASCICULATUM*	ADAIR	*WALKER 131*	NEMO	308.10
PANICUM OLIGOSANTHES V. *HELLERI*	ADAIR	*WALKER 118*	NEMO	315.10
PANICUM OLIGOSANTHES V. *HELLERI*	CLARK	*CONRAD 9806*	NEMO	315.10
ECHINOCHLOA CRUSGALLI V. *CRUSGALLI* F. *LONGISETA*	RANDOLPH	*CONRAD 10*	Nemo	338.10
ECHINOCHLOA CRUSGALLI V. *CRUSGALLI*	ADAIR	*CONRAD 7413*	NEMO	338.99
SETARIA FABERII	KNOX	*WELTON S.N.*	NEMO	344.00

CYPERACEAE

CYPERUS ESCULENTUS	CAMDEN	*SKINNER 810*	DNR	378.99
CYPERUS FILICULMIS V. *FILICULMIS*	CLARK	*WALKER 508*	NEMO	385.00
ELEOCHARIS ACICULARIS V. *ACICULARIS* F. *ACICULARIS*	RANDOLPH	*CONRAD 1*	NEMO	393.00
ELEOCHARIS TENUIS V. *VERRUCOSA*	SULLIVAN	*BROYLES S.N.*	NEMO	402.00
SCIRPUS ATROVIRENS V. *GEORGIANUS*	KNOX	*WELTON S.N.*	NEMO	421.20
SCIRPUS ATROVIRENS V. *GEORGIANUS*	MACON	*HEIN 15*	NEMO	421.20
FIMBRISTYLIS CAROLINIANA	CAMDEN	*SKINNER 950*	DNR	404.00
SCIRPUS LINEATUS	CAMDEN	*SKINNER 955*	DNR	424.00
SCIRPUS CYPERINUS V. *CYPERINUS*	CLARK	*WALKER 574*	NEMO	425.00
HEMICARPHA MICRANTHA	CAMDEN	*SKINNER 809*	DNR	429.00
SCLERIA TRIGLOMERATA	SULLIVAN	*CONRAD 9979*	NEMO	436.00
CAREX COOLUTA	MACON	*HEIN & NELSON 19*	NEMO	447.00
CAREX BLANDA	CAMDEN	*SKINNER 880*	DNR	500.00
CAREX GRANULARIS V. *GRANULARIS*	MACON	*HEIN & NELSON 18*	NEMO	502.00
CAREX AMPHIBOLA	MILLER	*NAGEL 52*	DNR	508.99
CAREX AMPHIBOLA V. *RIGIDA*	ADAIR	*WALKER 113*	NEMO	508.10
CAREX DAVISII F. *DAVISII*	SULLIVAN	*CONRAD 5872*	NEMO	512.00
CAREX SHORTIANA	CAMDEN	*SKINNER 922*	DNR	522.00
CAREX BUXBAUMII	CAMDEN	*SKINNER 677*	DNR	524.99
CAREX LUPULINA	MILLER	*SKINNER 1010*	DNR	548.99

JUNCACEAE

JUNCUS TENUIS	MILLER	*SKINNER 1017*	DNR	590.99
JUNCUS INTERIOR	CLARK	*CONRAD 9781*	NEMO	591.00

LILIACEAE

MELANTHIUM VIRGINICUM	MILLER	*NAGEL 305*	DNR	613.00
ALLIUM VINEALE	KNOX	*WELTON S.N.*	NEMO	618.99
LILIUM MICHIGANENSE	CAMDEN	*KELLNER 20*	DNR	627.00

IRIDACEAE

BELAMCANDA CHINENSIS	CAMDEN	*NAGEL 341*	DNR	676.00
SISYRINCHIUM BERMUDIANA	CAMDEN	*KELLNER 48*	DNR	679.00

ORCHIDACEAE

CYPRIPEDIUM CALCEOLUS V. *PARVIFLORUM*	CAMDEN	*NAGEL 1*	DNR	682.00
SPIRANTHES GRACILIS	MILLER	*SKINNER 755*	DNR	700.00
APLECTRUM HYEMALE F. *HYEMALE*	ADAIR	*CONRAD 9843*	NEMO	712.00
APLECTRUM HYEMALE F. *HYEMALE*	MACON	*HEIN28*	NEMO	712.00

SALICACEAE

SALIX HUMILIS	MILLER	*NAGEL 178*	DNR	725.99

JUGLANDACEAE

CARYA LACINIOSA	MILLER	*NAGEL 189*	DNR	746.00

ULMACEAE

CELTIS OCCIDENTALIS V. *CANINA*	MILLER	*NAGEL 74*	DNR	784.20
CELTIS OCCIDENTALIS V. *OCCIDENTALIS*	MILLER	*CAVENDER 143*	DNR	784.00

MORACEAE

MACLURA POMIFERA	MILLER	*NAGEL 303*	DNR	790.00
HUMULUS LUPULUS	ADAIR	*WELTON S.N.*	NEMO	792.00

POLYGONACEAE

RUMEX ALTISSIMUS	MILLER	*SKINNER 973*	DNR	811.00
RUMEX CRISPUS	CAMDEN	*SKINNER 1369*	DNR	814.99
POLYGONUM TENUE	ADAIR	*WALKER 166*	NEMO	824.00
POLYGONUM PENSYLVANICUM V. *EGLANDULOSUM*	ADAIR	*WELTON S.N.*	NEMO	829.30
POLYGONUM PERSICARIA V. *PERSICARIA*	CLARK	*WALKER 549*	NEMO	833.00
POLYGONUM PERSICARIA	MILLER	*SKINNER 989*	DNR	833.99
POLYGONUM HYDROPIPEROIDES	RANDOLPH	*CONRAD 10399*	NEMO	835.99
POLYGONUM CONVOLVULUS V. *CONVOLVULUS*	RANDOLPH	*CONRAD 10417*	NEMO	839.00

AMARANTHACEAE

AMARANTHUS TAMARISCINUS	CAMDEN	*SKINNER 814*	DNR	877.00
AMARANTHUS TORREYI	ADAIR	*WALKER 224*	NEMO	879.00
FROELICHIA GRACILIS	ADAIR	*WALKER 163*	NEMO	890.00
FROELICHIA GRACILIS	MILLER	*SKINNER 982*	DNR	890.00

PORTULACACEAE

CLAYTONIA VIRGINICA F. ROBUSTA	RANDOLPH	*CONRAD 10124*	NEMO	905.10
	CARYOPHYLLACEAE			
CERASTIUM VISCOSUM	CAMDEN	*SKINNER 890*	DNR	926.99
HOLOSTEUM UMBELLATUM	MILLER	*SKINNER 499*	DNR	930.00
SAPONARIA OFFICINALIS	CLARK	*WALKER 539*	NEMO	945.00
SAPONARIA OFFICINALIS	KNOX	*WELTON S.N.*	NEMO	945.00
ACTAEA PACHYPODA	MILLER	*NAGEL 304*	DNR	965.00
	RANUNCULACEAE			
RANUNCULUS MICRANTHUS V. MICRANTHUS	LEWIS	*CONRAD 9694*	NEMO	983.00
RANUNCULUS MICRANTHUS V. MICRANTHUS	RANDOLPH	*CONRAD 10125*	NEMO	983.00
RANUNCULUS RECURVATUS	CAMDEN	*SKINNER 673*	DNR	987.99
RANUNCULUS FASCICULARIS V. APRICUS	SULLIVAN	*BROYLES S.N.*	NEMO	993.10
CLEMATIS PITCHERI	RANDOLPH	*CONRAD 10118*	NEMO	1008.00
	CRUCIFERAE			
LEPIDIUM VIRGINICUM V. VIRGINICUM	KNOX	*WELTON S.N.*	NEMO	1051.00
THLASPI PERFOLIATUM	CAMDEN	*SKINNER 486*	DNR	1057.00
THLASPI PERFOLIATUM	MILLER	*SKINNER 589*	DNR	1057.00
DRABA VERNA	CAMDEN	*SKINNER 594*	DNR	1062.99
CARDAMINE PENSYLVANICA	CAMDEN	*SKINNER 656*	DNR	1074.99
ARABIS HIRSUTA V. ADPRESSIPILIS	CAMDEN	*SKINNER 891*	DNR	1080.10
ARABIS CANADENSIS	CAMDEN	*SKINNER 901*	DNR	1084.00
RORIPPA SYLVESTRIS	CLARK	*WALKER 459*	NEMO	1086.00
HESPERIS MATRONALIS	CAMDEN	*SKINNER 674*	SEMO	1094.00
SISYMBRIUM OFFICINALE V. LEIOCARPUM	MILLER	*SKINNER 1001*	DNR	1099.10
	ROSACEAE			
FRAGARIA VIRGINIANA	KNOX	*WELTON S.N.*	NEMO	1205.99
FRAGARIA VIRGINIANA V. ILLINOENSIS	MILLER	*NAGEL 22*	DNR	1205.10
RUBUS PENSILVANICUS	KNOX	*WELTON S.N.*	NEMO	1235.99
AGRIMONIA ROSTELLATA	ADAIR	*WALKER 54*	NEMO	1240.00
ROSA MULTIFLORA	KNOX	*WELTON S.N.*	NEMO	1242.00
ROSA SETIGERA V. SETIGERA F. SETIGERA	ADAIR	*WELTON S.N.*	NEMO	1243.00
	LEGUMINOSAE			
DESMANTHUS ILLINOENSIS	MILLER	*SKINNER 1014*	DNR	1269.00
DESMANTHUS ILLINOENSIS	ADAIR	*WELTON S.N.*	NEMO	1269.00
GYMNOCLADUS DIOICA	ADAIR	*CONRAD 5710*	NEMO	1272.00
GYMNOCLADUS DIOICA	RANDOLPH	*CONRAD 10223*	NEMO	1272.00
BAPTISIA LEUCANTHA	MILLER	*NAGEL 325*	DNR	1284.00
CROTALARIA SAGITTALIS	CAMDEN	*SKINNER 534*	DNR	1287.99
MELILOTUS OFFICINALIS	MILLER	*CAVENDER 135*	DNR	1305.00
PSORALEA PSORALIOIDES V. EGLANDULOSA	MILLER	*SKINNER 785*	DNR	1311.00
CORONILLA VARIA	CAMDEN	*SKINNER 1380*	DNR	1335.00

AMORPHA FRUTICOSA V. ANGUSTIFOLIA	ADAIR	*WALKER 102*	NEMO	1322.30
AMORPHA FRUTICOSA V. OBLONGIFOLIA	RANDOLPH	*CONRAD 10424*	NEMO	1322.20
DESMODIUM PANICULATUM V. DILLENII	ADAIR	*CONRAD 7338*	NEMO	1351.10
LESPEDEZA REPENS	ADAIR	*WALKER 217*	NEMO	1354.00
LESPEDEZA STIPULACEA	ADAIR	*WALKER 215*	NEMO	1368.00
APIOS AMERICANA V. AMERICANA F. PILOSA	ADAIR	*WALKER 164*	NEMO	1388.10
STROPHOSTYLES HELVOLA	CAMDEN	*NAGEL 370*	DNR	1393.99
STROPHOSTYLES LEIOSPERMA	MILLER	*NAGEL 352*	DNR	1395.00
	GERANIACEAE			
GERANIUM CAROLINIANUM	CAMDEN	*SKINNER 663*	DNR	1413.99
	ZYGOPHYLLACEAE			
TRIBULUS TERRESTRIS	CLARK	*WALKER 45*	NEMO	1418.00
	RUTACEAE			
ZANTHOXYLUM AMERICANUM	CAMDEN	*NAGEL 179*	DNR	1420.00
	SIMAROUBACEAE			
AILANTHUS ALTISSIMA	MILLER	*STRAATMANN 344*	DNR	1423.00
	POLYGALACEAE			
POLYGALA SANGUINEA	MILLER	*NAGEL 256*	DNR	1426.99
	EUPHORBIACEAE			
ACALYPHA VIRGINICA	MILLER	*SKINNER 1365*	DNR	1439.00
EUPHORBIA MARGINATA	MILLER	*SKINNER 817*	DNR	1452.00
	RHAMNACEAE			
CEANOTHUS AMERICANUS	MILLER	*SKINNER 927*	DNR	1498.99
	MALVACEAE			
HIBISCUS LASIOCARPOS	MILLER	*NAGEL 276*	DNR	1532.00
	HYPERICACEAE			
HYPERICUM PERFORATUM	MILLER	*CAVENDER 146*	DNR	1537.00
	CISTACEAE			
LECHEA RACEMULOSA	ADAIR	*WALKER 3*	NEMO	1555.00
	VIOLACEAE			
VIOLA PEDATA V. LINEARILOBA F. LINEARILOBA	SULLIVAN	*ROYLES S.N.*	NEMO	1557.10

ONAGRACEAE

EPILOBIUM COLORATUM	ADAIR	*WALKER S.N.*	NEMO	1601.00
OENOTHERA LACINIATA	CAMDEN	*SKINNER 1021*	DNR	1605.99

UMBELLIFERAE

ERYNGIUM YUCCIFOLIUM	MILLER	*BECK 14*	DNR	1634.99
TORILIS JAPONICA	CLARK	*WALKER 490*	NEMO	1642.00
TORILIS JAPONICA	KNOX	*WELTON S.N.*	NEMO	1642.00
ERIGENIA BULBOSA	MILLER	*SKINNER 600*	DNR	1645.00
CONIUM MACULATUM	SCHUYLER	*KEARSE S.N.*	NEMO	1646.00
POLYTAENIA NUTTALLII	ADAIR	*WALKER 132*	NEMO	1675.00
CRYPTOTAENIA CANADENSIS	CAMDEN	*SKINNER 921*	DNR	1655.00
TAENIDIA INTEGERRIMA	CAMDEN	*SKINNER 914*	DNR	1658.00

PYROLACEAE

MONOTROPA HYPOPITHYS	CAMDEN	*SKINNER 555*	DNR	1690.00
MONOTROPA HYPOPITHYS	MILLER	*NAGEL 365*	DNR	1690.00

PRIMULACEAE

LYSIMACHIA NUMMULARIA	MILLER	*SKINNER 1006*	DNR	1700.00
LYSIMACHIA LANCEOLATA	CAMDEN	*KELLNER 15*	DNR	1704.00

EBENACEAE

DIOSPYROS VIRGINIANA	MILLER	*NAGEL 70*	DNR	1713.99

OLEACEAE

FRAXINUS PENNSYLVANICA V. *PENNSYLVANICA*	RANDOLPH	*CONRAD 10464*	NEMO	1717.00

APOCYNACEAE

APOCYNUM CANNABINUM V. *PUBESCENS*	MILLER	*NAGEL 224*	DNR	1749.10
APOCYNUM SIBERICUM V. *SIBERICUM*	RANDOLPH	*CONRAD 10447*	NEMO	1750.00

ASCLEPIADACEAE

ASCLEPIAS PURPURASCENS	MILLER	*SKINNER 1015*	DNR	1754.00
ASCLEPIAS PURPURASCENS	KNOX	*WELTON S.N.*	NEMO	1754.00

CONVOLVOLACEAE

CONVOLVULUS SEPIUM V. *FRATERNIFLORUS*	KNOX	*WELTON S.N.*	NEMO	1780.30

HYDROPHYLLACEAE

ELLISIA NYCTELEA	CAMDEN	*SKINNER 658*	DNR	1807.00

BORAGINACEAE

HELIOTROPIUM INDICUM	CAMDEN	*SKINNER 805*	DNR	1816.00

BORAGINACEAE

MYOSOTIS VIRGINICA V. VIRGINICA	ADAIR	*WALKER 100*	NEMO	1831.00

VERBENACEAE

VERBENA BRACTEATA	CAMDEN	*SKINNER 819*	DNR	1844.00

LABIATAE

TEUCRIUM CANADENSE V. VIRGINICUM	KNOX	*ELTON S.N.*	NEMO	1853.00
SCUTELLARIA LATERIFLORA F. LATERIFLORA	RANDOLPH	*CONRAD 8896*	NEMO	1858.00
AGASTACHE NEPETOIDES	CAMDEN	*SKINNER 1383*	DNR	1864.00
AGASTACHE NEPETOIDES	MILLER	*NAGEL 281*	DNR	1864.00
NEPETA CATARIA	ADAIR	*WELTON S.N.*	NEMO	1866.00
NEPETA CATARIA	KNOX	*WELTON S.N.*	NEMO	1866.00
HEDEOMA PULEGIOIDES	CAMDEN	*SKINNER 724*	DNR	1895.00
HEDEOMA HISPIDA	CAMDEN	*SKINNER 896*	DNR	1896.00
PYCNANTHEMUM TENUIFOLIUM	MILLER	*BECK 15*	DNR	1900.00
PERILLA FRUTESCENS V. FRUTESCENS	ADAIR	*WALKER 214*	NEMO	1916.00

SOLANACEAE

SOLANUM ROSTRATUM	CLARK	WALKER 446	NEMO	1927.00
PHYSALIS VIRGINIANA	CAMDEN	SKINNER 668	DNR	1932.00

SCROPHULARIACEAE

LINDERNIA ANAGALLIDEA	CAMDEN	*SKINNER 812*	DNR	1957.00
PENSTEMON TUBAEFLORUS	ADAIR	*WELTON S.N.*	NEMO	1966.00
SCROPHULARIA MARILANDICA F. NEGLECTA	MACON	*HEIN 16*	NEMO	1971.10
VERONICA PEREGRINA V. PEREGRINA	RANDOLPH	*CONRAD 10334*	NEMO	1987.00
GERARDIA TENUIFOLIA	CAMDEN	*SKINNER 725*	DNR	1995.99

PLANTAGINACEAE

PLANTAGO LANCEOLATA	KNOX	*WELTON S.N.*	NEMO	2029.99
PLANTAGO ARISTATA	CAMDEN	*SKINNER 939*	DNR	2030.00
PLANTAGO VIRGINICA	MILLER	*SKINNER 869*	DNR	2033.99

RUBIACEAE

GALIUM APARINE	MILLER	*NAGEL 44*	DNR	2039.00
GALIUM OBTUSUM	CAMDEN	*SKINNER 863*	DNR	2047.99

CAPRIFOLIACEAE

LONICERA JAPONICA V. JAPONICA	KNOX	*WELTON S.N.*	NEMO	2064.00

CAMPANULACEAE

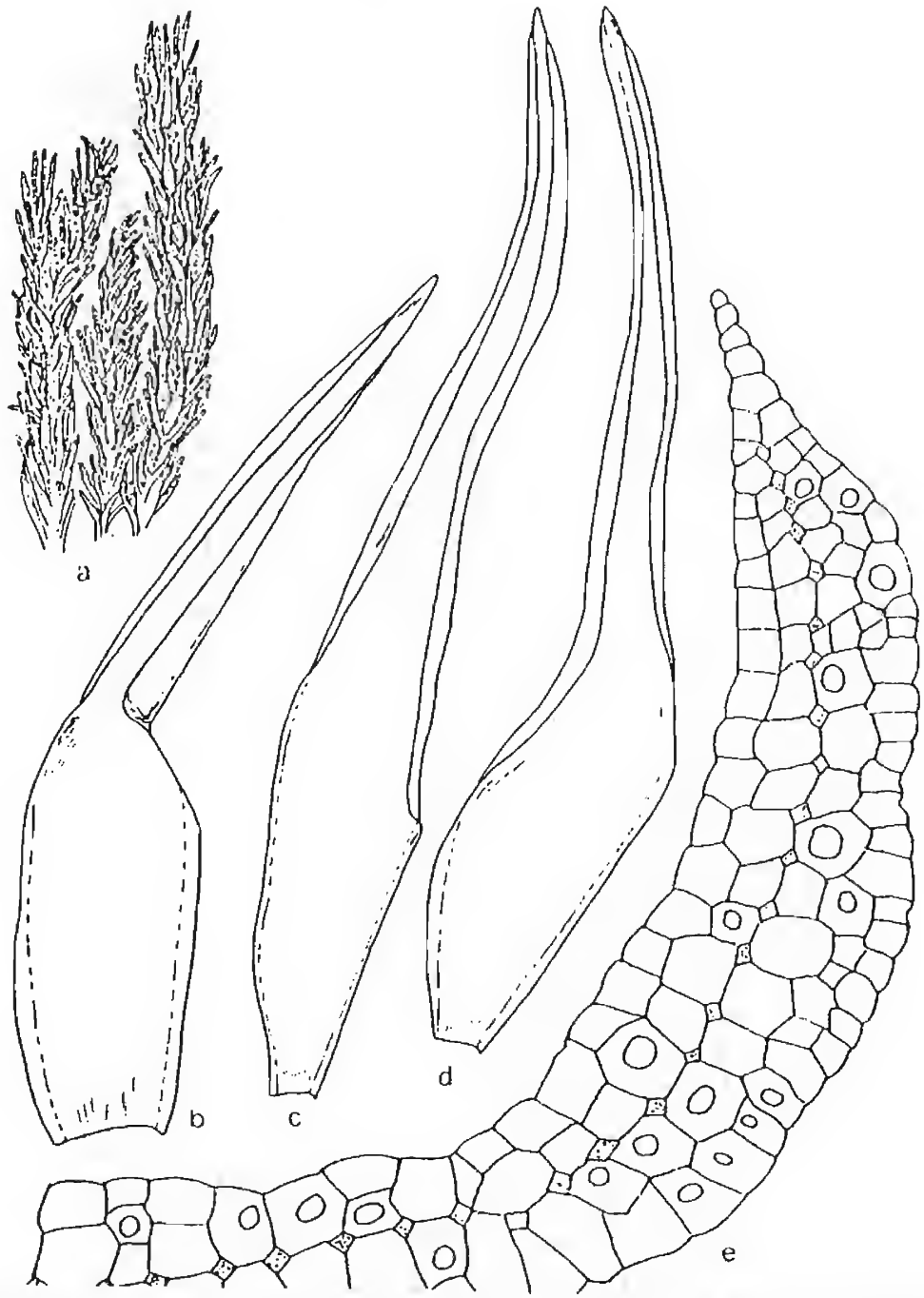
SPECULARIA BIFLORA	MILLER	*NAGEL 107*	DNR	2102.00
LOBELIA INFLATA	CAMDEN	*SKINNER 1384*	DNR	2106.00

COMPOSITAE

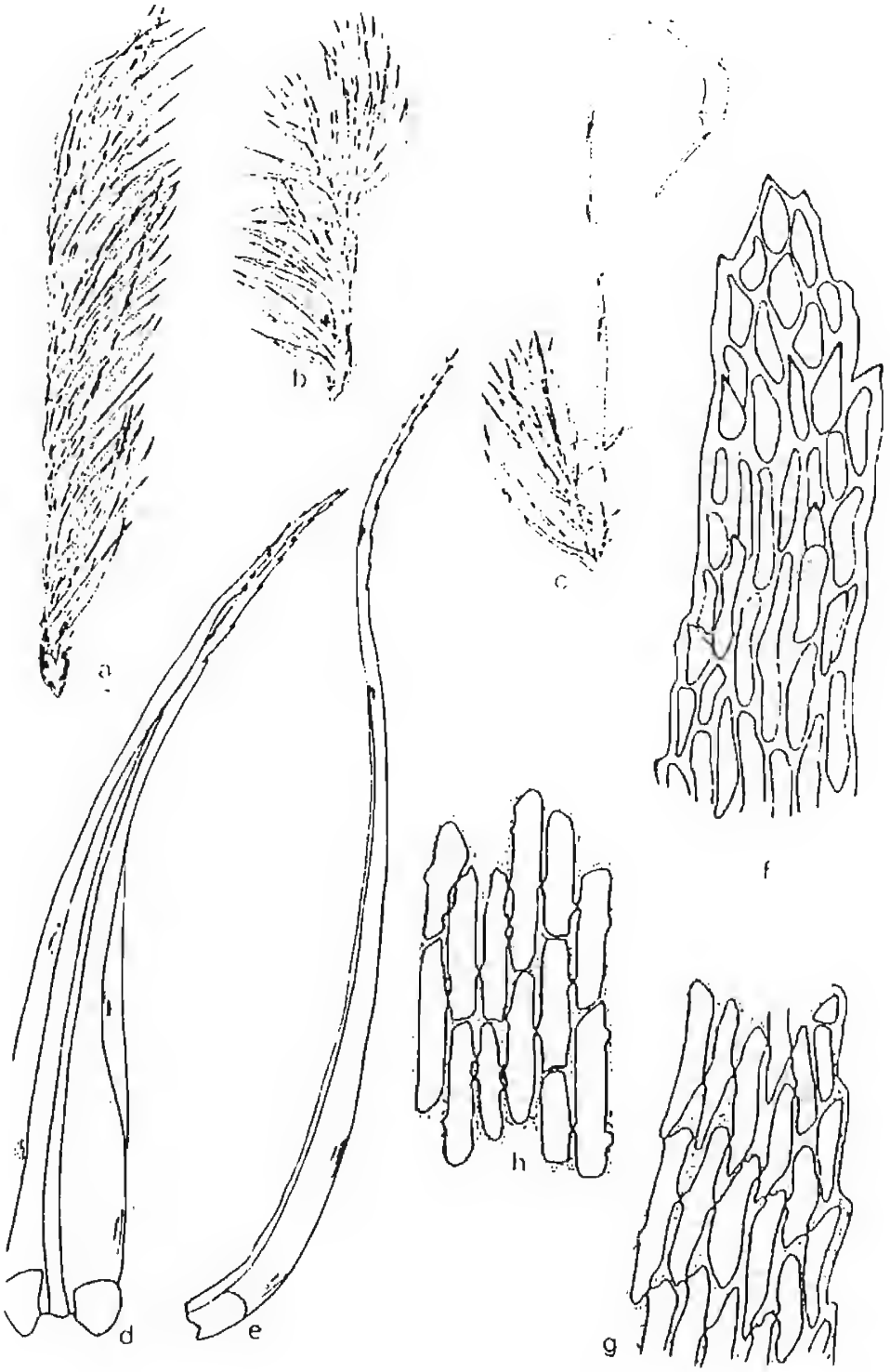
ELEPHANTOPUS CAROLINIANUS	MILLER	*NAGEL 278*	DNR	2116.99
EUPATORIUM SESSILIFOLIUM V. *BRITTONIANUM*	MILLER	*NAGEL 242*	DNR	2122.00
EUPATORIUM PERFOLIATUM V. *CUNEATUM*	SULLIVAN	*CONRAD 10035*	NEMO	2123.10
LIATRIS PYCNOSTACHYA	MILLER	*NAGEL 236*	DNR	2132.99
ASTER PILOSUS	MILLER	*SKINNER 553B*	DNR	2189.99
ANTENNARIA NEGLECTA	MILLER	*SKINNER 591*	DNR	2214.99
SOLIDAGO JUNCEA F. *JUNCEA*	SULLIVAN	*CONRAD 10046*	NEMO	2154.00
ASTER AZUREUS V. *AZUREUS* F. *AZUREUS*	MACON	*HEIN 26*	NEMO	2178.00
ASTER AZUREUS V. *AZUREUS* F. *LAEVICAULIS*	MACON	*HEIN 25*	NEMO	2178.10
ERIGERON PHILADELPHICUS F. *PHILADELPHICUS*	ADAIR	*WALKER 438*	NEMO	2206.00
ERIGERON STRIGOSUS V. *BEYRICHII*	ADAIR	*WELTON S.N.*	NEMO	2208.20
AMBROSIA ARTEMISIIFOLIA V. *ELATIOR* F. *VILLOSA*	ADAIR	*CONRAD 4247*	NEMO	2225.10
AMBROSIA ARTEMISIIFOLIA V. *ELATIOR* F. *VILLOSA*	KNOXW	*ELTON S.N.*	NEMO	2225.10
AMBROSIA ARTEMISIIFOLIA V. *ELATIOR* F. *VILLOSA*	LEWIS	*CONRAD 9650*	NEMO	2225.10
ECHINACEA PURPUREA	MILLER	*NAGEL 355*	DNR	2260.99
RATIBIDA PINNATA	KNOX	*WELTON S.N.*	NEMO	2265.00
HELIANTHUS HIRSUTUS V. *TRACHYPHYLLUS*	MILLER	*NAGEL 274*	DNR	2277.10
HELIANTHUS MAXIMILIANI	KNOX	*WELTON S.N.*	NEMO	2278.00
BIDENS CERNUA V. *INTEGRA*	RANDOLPH	*CONRAD 10401*	NEMO	2298.10
BIDENS CONNATA V. *PETIOLATA*	RANDOLPH	*CONRAD 10402*	NEMO	2299.00
CHRYSANTHEMUM LEUCANTHEMUM V. *LEUCANTHEMUM*	SULLIVAN	*BROYLES S.N.*	NEMO	2330.00
SENECIO PLATTENSIS	MILLER	*NAGEL 307*	DNR	2348.00
CIRSIUM ALTISSIMUM	MILLER	*NAGEL 298*	DNR	2359.99
CIRSIUM ALTISSIMUM	RANDOLPH	*CONRAD 8330*	NEMO	2359.99
CICHORIUM INTYBUS	CAMDEN	*SKINNER 1024*	DNR	2374.99
LACTUCA SCARIOLA F. *INTEGRIFOLIA*	KNOX	*WELTON S.N.*	NEMO	2389.10
LACTUCA SCARIOLA	MILLER	*NAGEL 238*	DNR	2389.99

COMMON MOSSES OF MISSOURI.

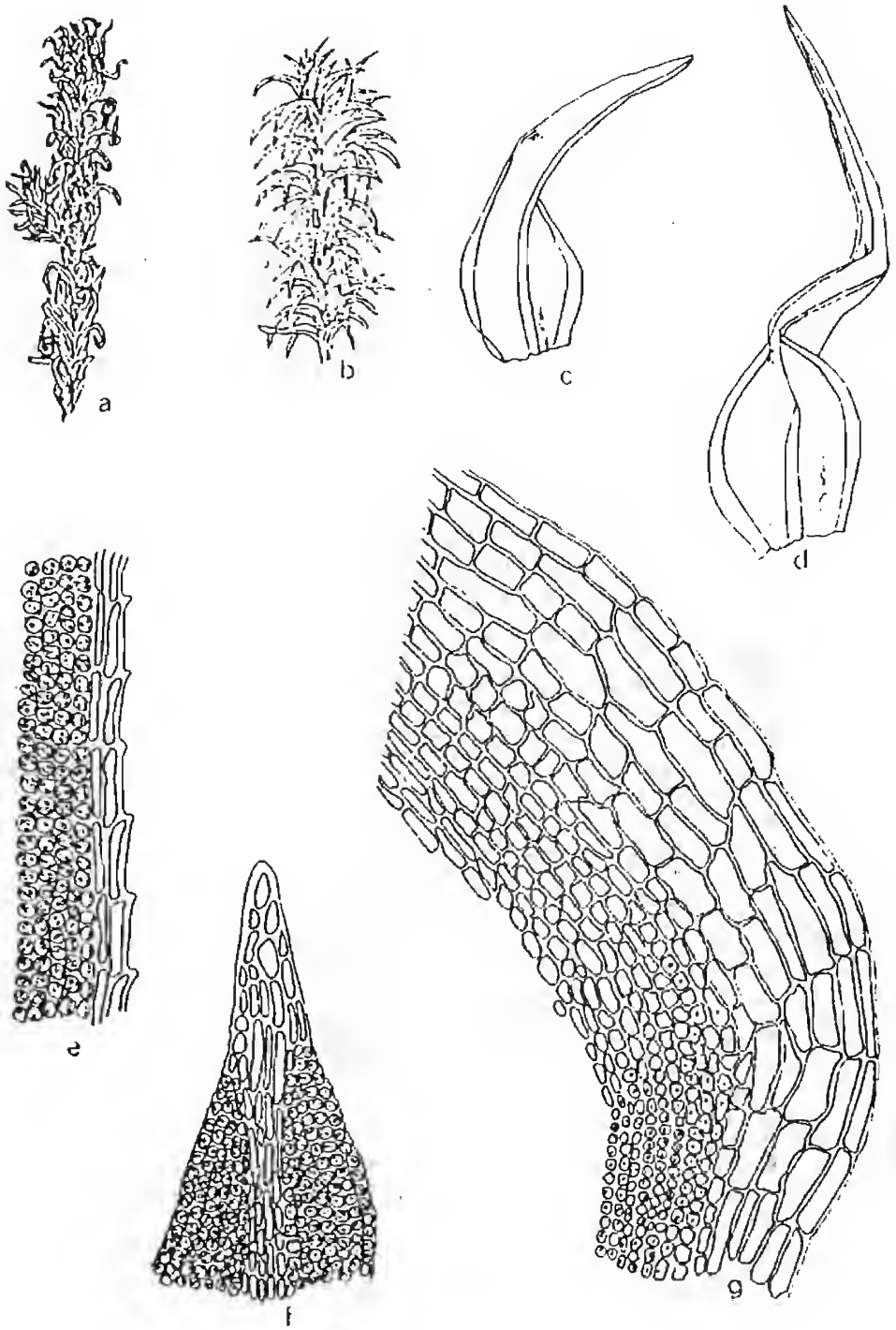
The moss flora of Missouri is diverse and contains many species of phytogeogrpahic significance. Most species are difficult to recognize in the field without extensive experience. However, some are rather large, distinctive, and common. As space allows, illustrations of scme of these species will be included in *Missouriensis* as filler. Paul L. Redfearn, Jr.



The Pin Cushion Moss [*Leucobryum glaucum* (Hedw.) Aongstr. *in* Fries.]: a. habit of gametophyte; b. leaves; c. cross sections of lower basal part of leaf showing the large cells lacking chlorophyll that are responsible for the whitish appearance of this moss. This moss gets its common name from it tendency to form large, whitish, pin cushion-like mats on rocky, acid soils of forests.



The Wind Blown Moss [*Dicranum scoparium* Hedw.]: a-b. habit of gametophytes; c. gametophyte with sporophyte; d-e. leaves; f. apex of leaf; g. upper leaf cells; g. lower leaf cells. This moss derives its common name from the tendency of the leaves on the upper stem to all twist in the same direction. Cushions of this moss are usually large, yellow-green to green and may be found growing on acid forest soils and shaded rock ledges.



Pleurochaete squarrosa (Brid.) Lindb. a: habit of dry plant; b. habit of moist plant; c-d leaves; e. cells of hyaline leaf border near middle of leaf; f. cells of apex of leaf; g. cells at base of leaf showing a broad band of hyaline cells along the margin. Although this moss has no common name, it forms large, extensive dense, yellow-green mats in cedar glades where is may be considered a characteristic member of its flora.